Jordan Valley Authority

Computer Business Mapping: Water Management Information System

Financial Accounting System Program

July 2000

FORWARD

Collaborative Approaches for Resolving Water Issues

Computer Mapping Reports:

- Budgeting And Accounting Systems
- √ **Water Management Information System**
- Inventory And Workshop Systems
- Land Information System
- Loan Information System
- Personnel And Payroll Systems

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ACRONYMS

DCM	Dirar Centre Module
H/W	Hardware
KAC	King Abdullah Canal
KFW	Kreditanstalt fur Weider Aufbau
MOF	Ministry of Finance
RDBMS	Relation Database Management System
RTU	Remote Transmission Units
SMS	Erno and Shair Management Systems
SOM	Stage Office Module
S/W	Software
VARCHAR2	Variable Character (database type)
WIP	Work In Progress
WMIS	Water Management Information System

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CHAPTER 1
INTRODUCTION

Scope

The purpose of this report is to document from a software perspective our understanding of the current computer system used for financial accounting at the JVA. A detailed description of accounting and of any related terminology and/or procedures is in the business process mapping documents (i.e., Revenue, Expenditures, Budget and Financial Accounting, Inventory and Fixed Assets, Workshop, and Payroll).

Methodology

The information in this report was gathered from the following sources:

- Interviews with end-users (i.e. employees currently using the applications);
- Documentation prepared by Erno and Shair Management Systems (SMS);
- Discussions with the information technology (IT) staff and with members of the oversight committee; and
- A study of the software in place from a functional and structural perspective.

The FAS program team understands and appreciates that the IT sector is very dynamic, so a cut-off date of 31 March was set for collecting information on the systems. Any changes made after that date will not be reflected in this document.

Project History

The project began in early 1983 when the company Erno/SMS issued a plan for implementing a water management information system (WMIS). The system was implemented in several phases.

Phase I (1983-1987) included the definition and installation of the required hardware, and the definition, development, installation and testing of several software packages including a socio-economic database for the Jordan Valley and a package related to the computerization of daily working procedures in connection with the irrigation water in the valley.

Phase II (1988-1989) included the upgrading of the hardware configuration of Phase I in order to fulfill the new tasks of Phase II and the implementation of new software packages related to the following activities:

- Land management
- Finance and personnel management
- Central workshop at Al-Fanoush
- Water balance module

Kreditanstalt fur Weider Aufbau (KfW) and SCP-Gresar were approached by the JVA to appraise the results of Phases I and II and to make recommendations for the following phase.

An interim phase was proposed which lasted from 1992 until 1996.

Phase III is the last phase of the project. It consists of three sub-phases:

Phase A: Upgrade hardware, operating system and networking; migration of the WMIS database from Oracle 5 to Oracle 7; migration of application software (except the supervisory system).

Phase B: Improvement and modifications of WMIS functions, database and user interfaces (excluding the supervisory system).

Phase C: Extension of the telemetry system (measurement network), automation of the King Abdullah Canal (KAC), and renewal of the supervisory system.

A new tender funded by Kreditanstalt fur Weider Aufbau Water Management Information System has been released to expand the WMIS to the Northern, Middle and Southern directorates and to the 14.5 km. stage office (Stage Office 9). It was originally limited to the control center in Dirar and to the nine stage offices in the Jordan Valley

Through this tender, the LANs at the control center, at the directorates, and at the stage offices will be linked together through the JVA 30 pair private communication cable. The cable extends over one hundred kilometers in length and covers a wide area alongside the KAC.

Phase A was completed successfully in 1997. The system is compromised of the following components:

- Measurement of KAC main inflow points;
- Monitoring of twelve check gates with four motorized check gates;
- Fourteen Remote Transmission Units (RTU) connected in a network through a 30 pair cable laid along the KAC and connected to Dirar center;
- A SCADA software system installed at Dirar for data collection and remote control of motorized check gates; and

The Phase B tender was submitted during the month of June 1999, and work is underway for Phase C of the project. The tender was submitted in December 1999.

CHAPTER 2
WMIS EXISTING HARDWARE/SOFTWARE STRUCTURE

Dirar Center

Dirar is equipped with the following:

- Digital Alpha 4000 Server running UNIX and ORACLE 7
- Windows NT RAS Server
- Prioris LX 5150 Server
- Mannesmann Tally T9208 Laser Printer
- Four Optimedia 5133 Client PCs.
- Equinox ELS-16 Terminal Server
- One 3 Com SuperStack-II hub with 24 ports
- Three Microcomm External Modems
- Citizen CI 600Q fast dot matrix printer
- Two Gateway 2000 PCs for SCADA

The Alpha Server is the database server. All WMIS applications are run on client PCs except the hydraulic module which is a Fortran application running on the Alpha Server.

Stage Offices

Every stage office is equipped with the following:

- Digital Prioris LX 5150 Server running MS-Windows NT 4.0 and ORACLE 7
- Two Optimedia 5133 Client PCs.
- Mannesmann Tally T2133 Dot Matrix Printer
- Mannesmann Tally T9208 Laser Printer
- One 3 Com SuperStack-II hub with 12 ports
- Microcomm External Modem

UPS are available at Dirar and at the stage offices.

CHAPTER 3
WMIS FUNCTIONS AND RELATED DATABASE

1. WMIS Database General Structure

The WMIS is distributed between the Dirar center and the nine stage offices. Data is replicated at different sites according to strict design rules: each stage office has only the set of data that is necessary to its function.

A master data set is maintained at Dirar. Modifications to data configuration can be made only at Dirar and then transmitted to remote sites.

The table below summarizes the main information in the WMIS database.

Table 3.1
Data Description and Distribution

Data Description	Generated at	Transferred to
Water Resources Characteristics	Dirar	
Reservoir Characteristics	Dirar	
KAC Characteristics	Dirar	
Water Suppliers Characteristics	Dirar	
Water Consumer Characteristics	Dirar	
Farm Unit Characteristics	Dirar	Stage Offices
Climatic Zone Characteristics	Dirar	
Crop Family Characteristics per Climatic Zone	Dirar	
Crop and Crop Family Water Quotas	Dirar	Stage Offices
Water Resources Monthly Flow	Dirar	
Canal Daily Status	Dirar	
Daily Water Management Information	Dirar	
Monthly Water Management Information	Dirar	
Plantings Data: Planting Register	Stage Offices	Dirar
Hourly Supplier Demand	Stage Offices	Dirar
Farm Dues and Payments Data	Stage Offices	Dirar
Irrigation Requests and Irrigation Orders	Stage Offices	
Field Report	Stage Offices	Dirar
Water Meter Information	Stage Offices	
Suspension of Water Deliveries to Farms	Stage Offices	

2. WMIS Modules

The application modules used with the current WMIS are the following:

2.1 Dirar Center (nine Modules)

- Seasonal Planning and Forecasting (DCM1)
- Monthly Functions (DCM2)
- Daily Water Balance (DCM3)
- Hydraulic (DCM4)
- System Tables (DCM5)
- Communication Function (DCM6)
- DBA Functions (DCM7)
- Long Term Water Balance (DCM8)
- Archive Functions (DCM9)

2.3 Stage Offices (three modules)

- Irrigation (SOM1)
- Accounting (SOM2)
- Communication Functions (SOM3)

Table 3.2
WMIS Functional Classification

FUNCTIONAL AREA	Module Name
Water Management Strategy	Seasonal Planning and Forecasting Module (DCM1) Monthly Functions Module (DCM2) Long Term Water Balance (DCM8)
Maintenance Tools	System Tables (DCM5) Communication Function (DCM6) DBA Functions (DCM7) Long Term Water Balance (DCM8)
Water Supply Application	Daily Water Balance Module (DCM3) Hydraulic Module (DCM4)
Water Distribution Application	Irrigation Module (SOM1) Accounting Module (SOM2)

3. Modules Functional Description

3.1 Seasonal Planning and Forecasting (DCM1)

The module is dedicated to the coming season and is comprised of essentially two parts: forecasting functions (water resources) and planning functions (water resources are balanced with requirements). The result of the SPF is the target volume in reservoirs and the monthly water quotas allocated to each water consumer.

3.2 Monthly Functions (DCM2)

This module allows the WMIS user to assign “crop water quotas” for the month and to compute “crop family quotas” which are sent to the stage offices for the computation of “farm weekly quotas” and “stage office weekly quotas.” The monthly functions are also dedicated to field data management such as the planting register, actual reservoir volumes and monthly water consumption. Some of the data are sent back to SPF.

3.3 Daily Water Balance (DCM3)

As daily water demands of users are compared with available resources, the water balance for the following day is prepared. Based on this balance, decisions are made on dam releases or pumping/releasing water from the KAC into connected reservoir(s). In the event of a water shortage, stage office daily quotas are reduced. If there is a water surplus, leaching operations may be encouraged, or, alternatively, the volume of water to be evacuated by spillways is computed.

3.4 Hydraulic (DCM4)

The module provides information on water levels in the canal upstream and downstream from the check gates connected to the measurement network, on the openings of all check gates expected inflows into the canal for the coming day, and on the program of outflows from the canal coming from the stage offices (“supplier hourly demand”).

3.5 DCM5-7, 9

These are used to maintain system tables, to replicate data to stage offices, to back up data, and to administrate the database.

3.6 Long Term Water Balance (DCM8)

This module has no links to the rest of the system. The purpose is to assess the effect of planned infrastructure on the Jordan Valley water balance using historical data.

3.7 Irrigation (SOM1)

The module is dedicated to the organization of water distribution to farmers. It computes stage office weekly quotas on a seasonal basis and sends them to Dirar. The computation

of the weekly quota is derived from farm water quotas, the planting register and the irrigation cycle. The module allows the user to update the planting register according to the field report.

Irrigation orders are produced on a daily basis according to farmers' requests and according to the water available (provided by Dirar). Hourly supplier demand is computed and sent to Dirar for the hydraulic module.

3.8 Accounting (SOM2)

Quantities actually consumed are entered to the system via this module based either on volumetric meter readings or on estimated values (irrigation time x nominal Farm Turnout Assembly (FTA) discharge). The module also prepares customer invoices and keeps track of farmers' bills and payments.

Figures 3.1 and 3.2 describe the computer systems at Dirar and in the stage offices.

Figure 3.1
Dirar's Current Computer System

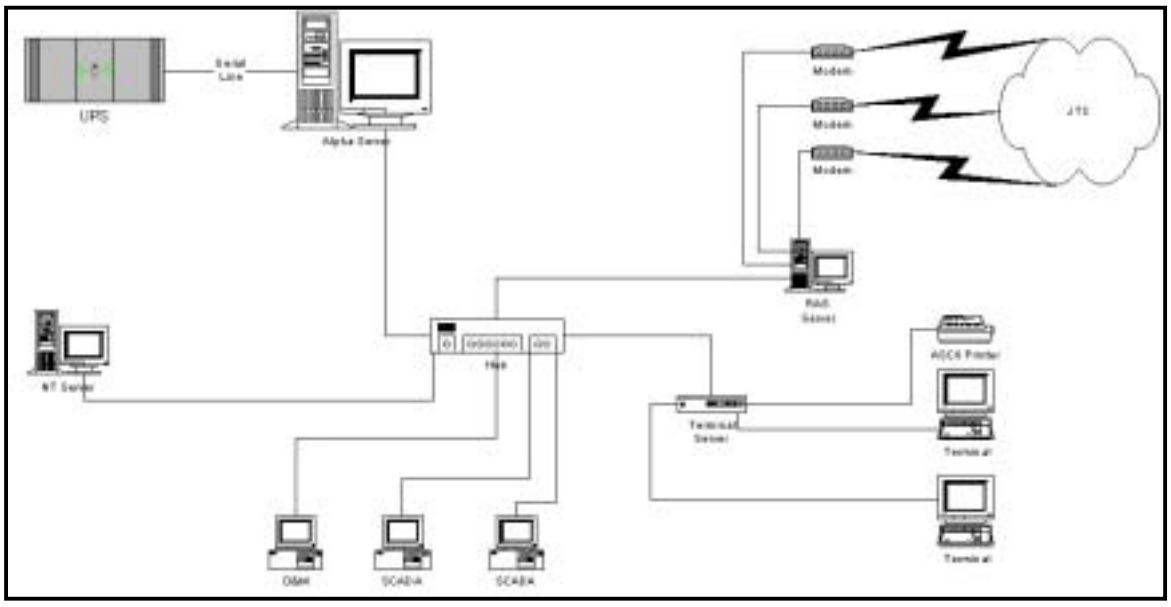

Figure 3.2
Stage Office Typical Current Computer System